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Conference of Empire Meteorologists, London, 1935

The meeting which terminated successfully at the Meteorological Office, South Kensington, on August 21st, was the third occasion on which representatives of the meteorological services of the British Empire had met to discuss the various meteorological problems which confront them.* The first Conference was convened by Sir Napier Shaw shortly after the Great War, but was somewhat limited in its scope as only six territories were represented. A more representative gathering assembled in London in 1929 and it was largely the success of this Conference which led to the third meeting which has just terminated.

On Monday, August 12th, twenty-nine delegates assembled at the Meteorological Office, South Kensington, and were welcomed on

* The photograph reproduced on the opposite page in which the majority of the members of the Conference appear was taken at the Meteorological Office, South Kensington, after the Saturday morning meeting. The names reading from left to right, are:—Seated: Dr. F. J. W. Whipple, Great Britain; Mr. N. R. McCurdy, Mauritius; Mr. C. W. Jeffries, Hongkong; Dr. T. Schumann, South Africa; Dr. E. Kidson, New Zealand; Sir George Simpson, Great Britain; Mr. J. Patterson, Canada; Dr. C. W. B. Normand, India; Mr. W. S. Watt, Australia; Mr. C. D. Stewart, Malaya; Mr. A. Walter, East Africa; Mr. G. K. Thornhill, Ceylon. Standing: Mr. R. D. Kreltszheim, Ceylon; Mr. R. G. K. Lempfert, Great Britain; Cdr. G. S. Ridgway, R.N. (ret.), Bermuda; Mr. G. W. Grabham, A.E. Sudan; Mr. D. W. Gumbley, Palestine; Capt. A. Bertram Smith, R.N.R., Trinidad; Mr. J. H. Churchill, Nigeria; Lt.-Cdr. S. H. Butler, R.N.R., Nigeria; Mr. L. J. Sutton, Egypt; Lt.-Col. E. Gold, Great Britain.

behalf of the Secretary of State for Air by Sir Henry Lyons, Vice-Chairman of the Meteorological Committee. In addition to Great Britain, twenty-five distinct territories were represented and it is gratifying to record that each Dominion and Colony which possesses an organised meteorological service was represented by the Director of the service. In this respect the Conference was even more representative than the 1929 meeting. It may be noted in this connexion that there had been considerable development in meteorology throughout the Empire since the last Conference. New meteorological services were then being established in British East Africa, Southern Rhodesia and Malaya, and the Directors of these services were now able to bring with them the results of six years' experience in their respective spheres. The development which had occurred since 1929 was reflected in the contributions which the various Dominions and Colonies made to the work of the Conference. Of the 68 memoranda which were circulated prior to the meeting as the basis of the discussions, no less than 42 were contributed by Empire services outside Great Britain.

The opening day of the Conference was devoted to the welcoming of the delegates by Sir Henry Lyons and to drawing up the programme of work. Mr. J. Patterson, Director of the Canadian Meteorological Service was unanimously elected President of the Conference and the success of the meetings which followed may be attributed in no small measure to his inspiration and tact and the energy with which he devoted himself to his task.

The development of Imperial Air Communications during the last ten years rendered it inevitable that aviation meteorology should figure largely in the work of the Conference and the whole of the second day was devoted to this subject. Mr. A. H. Self, Assistant Secretary, Air Ministry, addressed the Conference on the projected development of air mails throughout the Empire and gave an outline of the United Kingdom Government's proposals for the extension and development of existing air routes. He referred particularly to the part which meteorology would play in contributing to the safety and regularity of the projected air mail services. After a brief discussion on Mr. Self's address, Mr. F. Entwistle of the Meteorological Office, London, gave a brief account of the development which had taken place in Imperial Air Routes since the last Conference and referred to extensions in the meteorological services along certain sections of the England—India and England—South Africa air routes, which were in contemplation. A general discussion on the meteorological organisation along existing and projected Empire air routes followed and sub-committees were appointed to discuss the detailed organisation along certain sections of the routes. The remainder of the day was devoted to a discussion of the meteorological data required from various parts of the Empire for aviation purposes and particular attention was directed to charts of wind roses which had been prepared in the Aviation Services Division of

the Meteorological Office, designed to represent the normal surface and upper winds in any month over various areas of the globe. Special problems such as the accretion of ice on aircraft and the meteorological aid required for blind flying were also discussed.

The third, and part of the fourth days of the Conference were devoted to problems connected with Synoptic Meteorology. An interesting discussion took place on the methods of forecasting from synoptic charts in the course of which the various delegates described their experience of the application of the modern method of air mass analysis to the problem of forecasting in their respective countries. The discussion brought out very clearly the sharp contrast between the problem of weather forecasting in temperate latitudes and the corresponding problem in tropical regions. Experience in the latter field is relatively limited, but it is evident as meteorological services develop and demands for meteorological information increase, many new and interesting problems will arise which will create a wide field for further survey and research. The discussions on synoptic meteorology included consideration of the methods of plotting data on synoptic charts and of the form and application of the International Code for the exchange of weather messages, particularly in tropical countries. A further subject which aroused considerable interest was the value in weather forecasting of observations from ships at sea and of upper air data. In certain countries daily observations of the temperature and humidity at different levels are made from aeroplanes for the use of the forecast services and the discussion turned mainly on the possible use of alternative methods of observation and the methods of reducing and plotting the data.

The afternoon of the fourth day was devoted mainly to the meteorological requirements of the Fighting Services. The Superintendents of the Army and Navy Services Divisions of the London Meteorological Office introduced the discussions on the meteorological requirements within the Empire of the respective services. These discussions were followed by a consideration of certain questions relating to the use of meteorological instruments. Mr. N. P. Sellick, Director of the Meteorological Service of Southern Rhodesia, opened a discussion on the sensitivity and accuracy of barometers, while Mr. J. S. Dines, Superintendent of the Instruments Division of the Meteorological Office, London, described recent work which had been carried out in England on the standardisation of meteorological instruments. The discussion on instruments was continued the following day when the methods used in making observations of upper wind by means of pilot balloons and the generation of hydrogen for filling balloons in countries where the transport of hydrogen cylinders presented difficulties, were dealt with.

The main subject of the fifth day of the Conference was Marine Meteorology. Captain L. A. Brooke Smith, Marine Superintendent of the Meteorological Office, London, gave an account of the working

of the scheme by which weather reports from ships at sea are transmitted to land stations for the benefit of meteorological services and are exchanged between the ships themselves for navigation purposes. The scheme which had been put forward in 1929 by the International Conference for the Safety of Life at Sea, whereby 1,000 ships of all nationalities co-operate in a world-wide scheme for the transmission of weather reports by wireless, had been discussed very fully at the previous Conference of Empire Meteorologists held in the same year and the present meeting was concerned largely with the discussion of difficulties which had been felt in various parts of the Empire in the details of the working of the scheme. Captain Brooke Smith referred to recent arrangements which had been made for reports from ships registered in Great Britain and Northern Ireland, whereby the original instructions to the nautical authorities had been expanded in such a way as to provide a more effective service of weather reports than had been possible previously and expressed the view that these extended arrangements would meet most of the difficulties which had been experienced.

The two final days of the Conference were devoted to problems connected with Agricultural Meteorology and included discussions on the measurement of soil temperature and moisture, the climatological observations required for agricultural purposes and the time units employed for climatological purposes. Throughout these discussions the Conference had the benefit of the presence of Sir Napier Shaw and representatives of the Ministry of Agriculture and of home and Empire agricultural research establishments.

The foregoing resumé of the work of the Conference has been confined to the main subjects of discussion. Opportunity was also taken to deal with other problems of interest to meteorological services, such as the possibility of the exchange of personnel between the different Empire services and organised research in meteorology. Throughout the Conference the meetings were characterised by extreme cordiality and although few formal resolutions were passed it is beyond question that the discussions which took place will bear fruit in due course and will improve the effectiveness of the meteorological services of Great Britain and the Empire in the various branches of their work. Not the least important part of the Conference consisted in the informal discussions which took place as opportunity offered between the different delegates during which views were exchanged, difficulties discussed and constructive suggestions put forward. In the short period allotted for the Conference, there was naturally a vast field to be covered and a great deal of work to be accomplished. For this reason the social side was reduced to relatively narrow limits, but it was nevertheless pleasant and enjoyable. A happy opening to the Conference was provided by a reception on the evening of the first day by Sir George and Lady Simpson at the Meteorological Office, South Kensington. Sir George was naturally responsible for the arrangements for the

Conference and took an active and helpful part in all the meetings. On the evening of August 16th, Sir Philip Cunliffe Lister, Secretary of State for Air, presided at a dinner to the delegates given by H.M. Government and on Saturday afternoon, August 17th, the delegates and their friends were entertained at a garden party at Kew Observatory when they had an opportunity of seeing the work of the Observatory and of meeting members of the professional staff of the Meteorological Office.

Reference was made earlier to the active part taken and the stimulus provided throughout the Conference by the representatives of the Empire meteorological services. With the growing demand for meteorological information, particularly in view of the development of civil aviation, these services are bound to expand and increase. It is therefore possible to look forward with confidence to continued and increasing co-operation in meteorology throughout the Empire, which cannot but be stimulated by periodical conferences similar to the one which has just terminated.

F. ENTWISTLE.

Meteorology of Cirencester

From 1880–1913, systematic records of the weather conditions experienced at Cirencester were kept at the Royal Agricultural College. Fortunately, these records have been preserved, and it was considered that an article comparing the weather conditions experienced during the summer months (June to September inclusive) during the period of years 1880–1913, with those experienced during the summer months 1931–1934, might be of considerable general interest. With this object in view, a summary has been prepared, and comparisons made with the summer months during the years 1931–1934.

TABLE I.—RAINFALL (IN INCHES)

	June.		July.		August.		September.		Summer.	
	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.
Average ...	2·37		2·54		2·88		2·09		9·88	
Max.	4·73	4·29	7·15	4·12	6·69	5·98	6·65	3·73	15·67	16·95
Year	1903	1931	1880	1931	1912	1931	1896	1932	1882	1931
Min.	0·63	1·31	0·04	1·76	1·06	0·87	0·38	2·56	4·46	7·47
Year	1908	1932	1911	1933	1883	1933	1910	1931	1911	1933

Rainfall.—From the figures given above, it will be seen that the total rainfall for the summer of 1931 was 16·95 in. This was 1·28 in. more than the highest rainfall recorded during any summer during the whole period of years 1880–1913. During the whole period of years

1880–1913, there was only one June which recorded a higher total rainfall than that recorded during June, 1931 (i.e., June, 1903, when a total of 4·73 in. was recorded), and there was only one August which recorded a higher total rainfall than that recorded during August, 1931. The total rainfall of 0·87 in. recorded during August, 1933, was 0·19 in. lower than the lowest rainfall recorded during any August throughout the whole period of years 1880–1913.

Sunshine.—The summer of greatest sunshine during the years 1931–1934 was 864·7 hours during the summer of 1933. It is interesting to note that during the whole period of years 1880–1913, there were only three summers, viz., 1899, 1906 and 1911, when this total was exceeded. During the whole period of years 1880–1913, there was only one July (1911) which recorded more sunshine than July,

TABLE II.—SUNSHINE (HOURS)

	June.		July.		August.		September.		Summer.	
	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.
Average ...	194·1		195·0		181·0		144·0		714·1	
Max.	282·8	219·7	304·9	279·9	261·7	244·6	219·3	181·9	995·0	864·7
Year	1899	1932	1911	1934	1899	1933	1895	1933	1899	1933
Min.	103·4	176·5	105·6	132·0	101·5	143·1	84·4	96·1	532·4	547·9
Year	1909	1931	1888	1932	1912	1931	1896	1931	1888	1931

1934. There was only one August (1899) which recorded more sunshine than August, 1933. There were only two Septembers, viz., September, 1896 and 1909, which recorded a lower total number of hours sunshine than September, 1931. On July 8th, 1934, a total of 15·0 hours sunshine was recorded. During the whole period of years 1880–1913, there were only two days—June 9th, 1892, and June 30th, 1894—when this day's total sunshine was exceeded.

Temperature.—The summer with the highest mean maximum and mean minimum temperatures during the years 1931–1934, was 1933, when the mean maximum temperature was 71·2° F., and the mean minimum 51·2° F. There was only one summer, that of 1911, when a higher mean maximum temperature was recorded, and the mean minimum temperature of 51·2° F. recorded during the summer of 1933 was 0·1° higher than the highest mean minimum temperature recorded during any summer during the period 1880–1913. The lowest mean maximum and mean minimum temperatures recorded during the summers 1931–1934 were 63·7° F., and 49·4° F. during the summer of 1931. In the earlier period there were only two summers, viz., 1888 and 1912, when lower mean maximum temperatures were recorded. There were only two Augusts (1899 and 1911) which recorded higher mean maximum temperatures than August, 1933.

There were only three Septembers which recorded higher mean maximum temperatures than September, 1933. There were only two Septembers, viz., 1894 and 1912, which recorded lower mean maximum temperatures than September, 1931. There was only one July, that of 1901, which recorded a higher mean minimum

TABLE III.—TEMPERATURE (° F.)

	June.		July.		August.		September.		Summer.	
	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.	1880–1913.	1931–4.
Average—Max.	66·0		69·2		68·0		63·6		66·7	
Min.	47·7		51·1		49·9		46·8		48·9	
Highest Max. ...	70·8	69·3	78·1	75·6	76·6	74·4	70·8	67·7	72·9	71·2
Year	1893	1933	1911	1934	1911	1933	1895	1933	1911	1933
Lowest Max. ...	61·0	65·5	62·9	65·7	61·2	64·6	58·2	58·9	62·7	63·7
Year	1907	1931	1888	1931	1912	1931	1894	1931	1912	1931
Highest Min. ...	51·0	49·9	55·5	54·0	54·1	54·6	50·5	50·0	51·1	51·2
Year	1881	1931	1901	1933	1911	1932	1880	1933	1880	1933
Lowest Min. ...	45·1	46·4	48·5	51·0	46·8	48·8	40·6	46·0	47·0	49·4
Year	1904	1932	1907	1931	1912	1934	1910	1931	1904	1931

temperature than July, 1933. The highest mean minimum temperature recorded during any August during the years 1931–1934 was 54·6°F. during August, 1932. This was 0·5° higher than the highest mean minimum temperature recorded during any August during the whole period of years 1880–1913. During the whole period of years 1880–1913, there was only one September, that of 1880, which recorded a higher mean minimum temperature than September, 1933.

THOMAS F. PROSSER.

OFFICIAL NOTICES

Airport

The term " Airport " expressed as a single word has been adopted officially by the Air Ministry for general use as denoting " a permanent civil aerodrome at which facilities for customs and immigration clearances are available so as to provide an appropriate port of entry and departure for aircraft to and from a country."

Discussions at the Meteorological Office

The series of meetings for the discussion of recent contributions to meteorological literature especially in foreign and colonial journals, will be resumed at the Meteorological Office, South Kensington, during the session 1935–6. The meetings will be held on alternate

Mondays at 5 p.m., beginning on Monday, October 14th, 1935, when Sir George Simpson, K.C.B., D.Sc., F.R.S., will open the discussion; the subject will be "Results of the recent Empire and International Meteorological Conferences."

The dates for subsequent meetings are as follows:—

October 28th, November 11th and 25th, December 9th, 1935; January 13th and 27th, February 10th and 24th, and March 9th, 1936.

The Director of the Meteorological Office wishes it to be known that visitors are welcomed at these meetings.

OFFICIAL PUBLICATIONS

The following publications have recently been issued:—

Annual Report *of the Director of the Meteorological Office presented by the Meteorological Committee to the Air Council for the year ended March* 31, 1935.

In its main lines the work of the Meteorological Office during the year under review has continued as in previous years, but the demands made on the Office have continued to grow and every division shows an increase in the amount of information supplied. The Aviation Services Stations report a total increase of 18,747 inquiries and 2,404 weather reports passed to aircraft in flight, on the corresponding figures for the previous year, these figures being exclusive of inquiries relating to weather and climate. Since the reorganisation of the Office after the war there have been separate divisions for forecasts and aviation but as the result of experience it has been decided that the most efficient method of work would be to combine the two divisions under one head with two senior officers as deputies, and on October 1st, 1934, the initial step in the reorganisation was made and the two divisions combined.

The year has been an important one in the history of the Naval Division since it has seen the attainment of the objective towards which the Division in close co-operation with the Admiralty has been working for many years—the creation of a forecasting service within the Fleet which shall be self-contained yet, in virtue of the fact that the Naval Division is so closely connected with its control and development, not independent of the State Meteorological Service. It is anticipated that the scheme will be in full operation by the end of 1936.

Other changes of importance during the year were in the Gale Warning Service and in the Fishery Barometer and Baragraph Service. From September 1st, 1934, the Meteorological Office will be responsible only for the preparation and issue of the necessary gale warning telegrams, while the Board of Trade will organise and administer the exhibition of the warnings. There are about 230 points around the coasts where cones are hoisted on suitable masts

to warn shipping and the Board of Trade will, in future be responsible for the choice of sites and the supply of the necessary cones. The Fishery Barometer and Barograph Service, in accordance with the new regulations introduced on January 1st, 1935, is to be administered by the Meteorological Office through the local Fishery Officers of the Ministry of Agriculture and Fisheries and the Fishery Board of Scotland, each Fishery Officer being responsible for the supervision of the stations in his area.

During the year the Office has lost the services of Mr. D. Brunt, M.A., who resigned on appointment to the Professorship of Meteorology at the Imperial College of Science and Technology.

PROFESSIONAL NOTES.

No. 67. *The rates of ascent and descent of free balloons, and the effects of radiation on records of temperature in the upper air.* By L. H. G. Dines, M.A. (M.O. 336g).

This paper first discusses the vertical velocities of free rubber balloons of about one to two metres diameter; being a continuation of the previous work on smaller balloons by Messrs. Th. Hesselberg and B. J. Birkeland. Secondly, it analyses the results of a number of records of temperature in the stratosphere in England, with a view to determining how far they are affected by direct radiation from the sun on the meteorograph. The conclusion is reached that at heights of 18 Km. and over, records obtained during daylight may be liable to appreciable error.

Correspondence

To the Editor, *Meteorological Magazine*

Halo phenomena of Spring, 1935 in New England

Complex halos were unusually common last spring in New England as well as in England. The display at midday, March 4th, seen both at Blue Hill and Mt. Washington, included the 22° halo, parhelia and upper and lower tangent arcs, a portion of the 46° halo and infralateral tangent arcs, and the parhelic circle, and, at Mt. Washington alone, upper anthelic arcs and a suggestion of paranthelia. Four years ago, Bergeron and I saw infralateral tangent arcs of the 46° halo, with 22° halo, parhelia and upper and lower tangent arcs, at Ustaoset, Norway (September 2nd, 1931, 10.15 a.m. to 12.30 p.m.). A brilliant lunar complex, seen on March 20th, 9–11 p.m., at Blue Hill, included the 22° halo, parselenae and upper and lower tangent arcs, the 46° halo and circumzenithal arc, all beautifully colored, also the parselenic circle, practically complete and a moon pillar. A corresponding solar display, without the pillar, was seen on April 4th, from 7 to 9 a.m.

A brilliant segment of a parhelic circle 20 to 25° in extent and 2½° wide, passed from north-west to north-east with the movement

of the virga from iridescent altocumulus, March 14th, 11.25 to 11.35 a.m. This bright arc was white for the middle 1° and red on the borders (about $\frac{3}{4}$° above and below the white). The zenith distance of the sun and also of the arc was 46°, measured with a theodolite. This phenomenon was viewed by the several members of the Blue Hill Observatory staff. Being unable to find a description of a red bordered parhelic circle, I wonder if any readers of this note have seen one.

In Fig. 1, of the July *Meteorological Magazine*, is it not probable that A is the 22° halo, and B the elliptically joined upper and lower tangent arcs, which at solar altitude 50° are quite likely to give the impression of being a circumscribed halo (cf. Fig. 200 in Humphreys' "Physics of the Air", New York, 1929)?

CHARLES F. BROOKS.

Blue Hill Meteorological Observatory, Milton, Massachusetts, U.S.A., August 10th, 1935.

Unusual Optical Phenomena

A correspondent at Stratton-on-the-Fosse, near Bath, writes that "Last Friday morning, July 26th, at 11.30 a.m., I saw in the sky something I have never seen before. What I saw was an immense circle in the sky, sharp and well defined, but entirely outside the sun, which was shining brightly all the time. The circle was due west of the sun at 11.30 a.m. Inside the circle was what perhaps was a 'mock-sun.' It was behind a lot of haze or fog, and was a bright undefined spot, with two or three bands of prismatic colours across it. The outer edge of the great circle was fairly sharply defined, and did not go off into haze as a solar halo does.

"The children in our village school called my attention to the circle, it was composed of what looked like thin white cloud—it was not a dense circle, but absolutely plain, all the same. The children say they saw it when going into school at 9.15 a.m. I watched it for about 10 minutes, and it never changed at all. One of the village boys told me that at 12.30 p.m. large clouds had come across most of the circle, and hidden it, but 'he could still see pieces of it'."

Mirage near Sealand

On August 6th, 1935, at about 1145 G.M.T., a well-developed mirage was observed near Sealand. A car travelling along a road which had recently been tarred was approaching the observer, and it appeared as though the car was in water up to the axles, while another car appeared to be resting on the top of the original car in an inverted position.

The phenomenon was observed at about eye level as I was ascending a slight incline. The mirage was in evidence while the car moved from 200 yards to within 40 yards of the point of observation.

The sky was less than a quarter covered with small cumulus clouds, the wind was WNW. about 10 m.p.h., and the temperature between 70° and 75° F.

GEO. R. READ.

Roker, Station Road, Gt. Saughall, Chester, August 17th, 1935.

Water Spout at Bude

This morning at 7.50 G.M.T., with the wind NW. force 3, a storm of rain drifted from the sea into Bude. The storm was brought by a ragged nimbus cloud above which were detached cumulus clouds. At the south-east end of the cloud, which was drifting very slowly east-south-east, was a long slender column of cloud, very distinct and reaching down to below my view, but (I should judge that) before it reached land it broke off as it rapidly grew shorter, the end being ragged all the time and by 7.58 G.M.T. the only trace of it was a snaky lighter patch on the nimbus cloud.

I take it to be a water spout, but the wind fresh and keen last night, 4–5 and 3 this morning, seems very slight for it. During the night there were heavy rain storms and occasional thunder and lightning to the south-west and north-west.

KARL DURSTON.

The School House, Bude, Cornwall, August 28th, 1935.

Funnel Clouds seen from Hastings

Between 13h. 10m. and 13h. 20m. G.M.T. on August 27th, 1935, two black elongated projections were noted hanging from the base of a heavy cumulonimbus cloud over the sea to the south; they were travelling towards the east slowly. The projection on the left quickly dissolved, appearing to contract into the base of the cloud. The other varied in length and breadth from minute to minute and was slightly inclined towards the left; it exhibited signs of rapid motion, especially at its tip, which seemed to quickly dissolve and then reform. Heavy rain was falling from the cloud immediately behind the projections. The movement of clouds overhead at 13h. indicated varied air currents. A species of fairly low cirrus nothus of white appearance was moving from south-south-west at that hour, but within five minutes had changed its direction to south-south-east. A layer of fractocumulus which was moving from west-north-west before 13h., was moving from south-west by 13h. 3m. The surface wind remained persistently from WNW and was light to moderate in force. Showers developed over the land a little later in the afternoon and distant thunder was heard at 16h. 55m. to north-north-west, while after dark, lightning was seen for several hours, to north-east and south-east.

A. E. MOON.

39, *Clive Avenue, Clive Vale, Hastings, September 2nd*, 1935.

Note on a Dust-Devil observed at Manston

A small dust-devil was observed near the Meteorological Office at 10h. 30m. G.M.T. on July 10th. This formed on a sandy path passing near the corner of a hangar, and moved along the path from the south-east at a speed estimated to be about 10 m.p.h.; the wind at the moment also had this speed and direction. When the dust-devil reached the main road at the end of the path, it was intercepted by a passing omnibus; nevertheless, it resumed its existence on the far side of the road, although owing to the smaller amount of dust there, it could only be observed momentarily. When first seen it was about 6 ft. high and the greatest diameter, near the top, was about 4 ft.; the rotation was clockwise. The meteorological situation was as follows: Wind, SE., 10 m.p.h.; cloud, large cumulus 1/10, cirrus 2/10; temperature, 73° F.; humidity, 60 per cent. The sun had been shining continuously from 6h. 30m.

A. F. CROSSLEY.
C. C. NEWMAN.

Meteorological Station, R.A.F., Manston, Kent, July 12th, 1935.

Dust-Devil in the Midlands

The formation of a dust-devil or dust whirl in England is probably a fairly rare occurrence and details of such a phenomenon may, therefore, be of interest. On Monday, August 5th, 1935, a small, though well-defined dust-devil, developed in a small depression on Brownhills Heath, Staffordshire. It was first observed at 1315 B.S.T., and was rotating in a counter clockwise direction relative to a vertical axis. The height of the whirl was about 20 ft., while the diameter increased from about 4 ft. at the base to 6 ft. at the top. A large amount of dust and vegetable debris together with pieces of, paper and cardboard, in some cases approximately 6 in. square, were drawn up into the whirl. The pieces of paper and cardboard described spiral paths the diameter of which increased with height. The speed of rotation was 120 revolutions per minute for two minutes after which it suddenly decreased and at the same time the material in suspension fell back to the surface indicating that the ascending currents had also decreased.

At the time of the observation conditions were favourable for the development of a superadiabatic lapse rate in the air layers near the ground. The wind was calm and the only clouds present were 3/10 of small cumulus with their base at 4,000 ft.

WILLIAM D. FLOWER.

15, *Brook Lane, Chester, August 16th*, 1935.

Fog Wreath on Cissbury Down

About 8h., B.S.T., on August 20th, the coastal lowlands near Worthing were covered by a shallow layer of mist, thin enough for the lower slopes of Cissbury Down to be seen somewhat indistinctly from the railway west of West Worthing. Above the mist the greater part

of the hill stood out clearly, except for a narrow belt of quite dense fog resting on the southern and western flanks towards the top. Cissbury is an old camp, encircled by a deep dyke and earthwork, the notch of which can just be seen against the skyline on the west. The preceding night had been calm and clear; the lowland mist was of the radiation type and there can be no doubt that the fog wreath on the hill marked the position of a belt of cold air where the drainage from the upper slopes was trapped in the old earthwork.

C. E. P. Brooks.

Epsom, Surrey, August 23rd, 1935.

Rain in advance of true "warm front" rain

In the May number of this magazine, there is a short comment by me on a note from D. Dewar, referring to a minor warm front ahead of the main one. A few other such cases can be found, but in my opinion the commonest cause of the phenomenon in question is to be sought rather in undulations on a single gently sloping surface of discontinuity, with the "advance" rain falling from above 6,000 ft., perhaps sometimes from above 10,000 ft. The banded structure of the rain area may indicate either true waves or elongated cells parallel to the wind shear up aloft. Thus, the cause is probably usually in the upper air, but occasionally convergence at a coast line in the lowest 2,000 ft. or so lifts up the frontal clouds considerably higher up. The case of May 8th, 1934, discussed by C. W. G. Daking,* appears to have been of this type. The Duxford observations showed an inversion at about 8,000 ft. at 6h. and 7,000 ft. at 12h., and the connexion of this with the front over Ireland gives a slope of about 1 in 270. In general a low angle of slope means light rain extending far ahead of the front, and Daking is justified in his contention that an additional factor is required to explain the moderate rain on the East Anglian coast (6 mm. at Felixstowe, and 4 mm. at Yarmouth up to 18h.). The obvious one is the sea breeze, of which the effect is shown on the charts. When a damp current crosses quite low hills, clouds are commonly formed right up to the middle troposphere, and in the same way convergence at low levels can lift a large overlying air mass. From the observed temperatures and humidities at Duxford at 12h., it can readily be shown that an ascent of 1,000 ft. would have caused no condensation below 6,000 ft., but would have produced rainfall of the required amount from above that level, over a belt some 30 miles wide. (At Lympne at 11h. the wind at 6,000 to 10,000 ft. was about 30 m.p.h. from west. If the whole air column, as observed at Duxford, ascended 1,000 ft., the possible rainfall would have been 1·3 mm., all from above 6,000 ft.† A rainfall

* *Meteorological Magazine*, 70, 1935, p. 40.

† Evaporation below 6,000 feet would have diminished the amount reaching the ground, but as the movement in the lower air was relatively small, this air would have become slowly saturated, and then the rain would have fallen freely.

Note on a Dust-Devil observed at Manston

A small dust-devil was observed near the Meteorological Office at 10h. 30m. G.M.T. on July 10th. This formed on a sandy path passing near the corner of a hangar, and moved along the path from the south-east at a speed estimated to be about 10 m.p.h.; the wind at the moment also had this speed and direction. When the dust-devil reached the main road at the end of the path, it was intercepted by a passing omnibus; nevertheless, it resumed its existence on the far side of the road, although owing to the smaller amount of dust there, it could only be observed momentarily. When first seen it was about 6 ft. high and the greatest diameter, near the top, was about 4 ft.; the rotation was clockwise. The meteorological situation was as follows: Wind, SE., 10 m.p.h.; cloud, large cumulus 1/10, cirrus 2/10; temperature, 73° F.; humidity, 60 per cent. The sun had been shining continuously from 6h. 30m.

A. F. Crossley.
C. C. Newman.

Meteorological Station, R.A.F., Manston, Kent, July 12th, 1935.

Dust-Devil in the Midlands

The formation of a dust-devil or dust whirl in England is probably a fairly rare occurrence and details of such a phenomenon may, therefore, be of interest. On Monday, August 5th, 1935, a small, though well-defined dust-devil, developed in a small depression on Brownhills Heath, Staffordshire. It was first observed at 1315 B.S.T., and was rotating in a counter clockwise direction relative to a vertical axis. The height of the whirl was about 20 ft., while the diameter increased from about 4 ft. at the base to 6 ft. at the top. A large amount of dust and vegetable debris together with pieces of, paper and cardboard, in some cases approximately 6 in. square, were drawn up into the whirl. The pieces of paper and cardboard described spiral paths the diameter of which increased with height. The speed of rotation was 120 revolutions per minute for two minutes after which it suddenly decreased and at the same time the material in suspension fell back to the surface indicating that the ascending currents had also decreased.

At the time of the observation conditions were favourable for the development of a superadiabatic lapse rate in the air layers near the ground. The wind was calm and the only clouds present were 3/10 of small cumulus with their base at 4,000 ft.

William D. Flower.

15, *Brook Lane, Chester, August 16th*, 1935.

Fog Wreath on Cissbury Down

About 8h., B.S.T., on August 20th, the coastal lowlands near Worthing were covered by a shallow layer of mist, thin enough for the lower slopes of Cissbury Down to be seen somewhat indistinctly from the railway west of West Worthing. Above the mist the greater part

of the hill stood out clearly, except for a narrow belt of quite dense fog resting on the southern and western flanks towards the top. Cissbury is an old camp, encircled by a deep dyke and earthwork, the notch of which can just be seen against the skyline on the west. The preceding night had been calm and clear; the lowland mist was of the radiation type and there can be no doubt that the fog wreath on the hill marked the position of a belt of cold air where the drainage from the upper slopes was trapped in the old earthwork.

C. E. P. Brooks.

Epsom, Surrey, August 23rd, 1935.

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* *Meteorological Magazine*, 70, 1935, p. 40.

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averaging 1·3 mm. per hour over a belt 30 miles wide was thus possible.)

The angle of slope of a surface of discontinuity, and its changes, involve important and difficult theoretical questions. I have discussed the matter in a short paper I am contributing to the Royal Meteorological Society, which aims at clarifying the practical problem rather than at solving the extremely difficult theoretical problem. In my opinion the mathematical discussion of ideal fronts has not yet led to anything which can be applied practically. In many cases the horizontal temperature gradients within the air masses must also be taken into account. An upper current which carries rain far in advance of a warm front seems to be associated with a general temperature gradient, additional to the gradient due to the front itself.

C. K. M. Douglas.

August 24th, 1935.

NOTES AND QUERIES

Beit Fellowship for Research in Meteorology

The Trustees of the Beit Fellowships have awarded, amongst others, a Beit Fellowship at the Imperial College of Science and Technology during the academic year 1935–6 to Mr. E. W. Hewson of the Mount Allison University, Sackville, Canada, and the University of Toronto, for research in Meteorology, more especially the detailed structure of discontinuities between air masses as occurring in England and Canada, under Professor D. Brunt. The fellowships are for one year, renewable for a second year. This is the first time a fellowship has been awarded for research in meteorology.

Incidence of Rainfall and Thunderstorms on the Coasts of the British Isles

A comparison of the incidence of rainfall and thunderstorms on the east and west coasts of the British Isles was recently made. The results seem of sufficient general interest to be placed on permanent record. The stations used for the east coast are Aberdeen, Scarborough (North Shields for thunder) and Kew; for the west coast Sumburgh Head, Stornoway, Valentia and Scilly. Sumburgh Head is included as representative of the west coast because of the

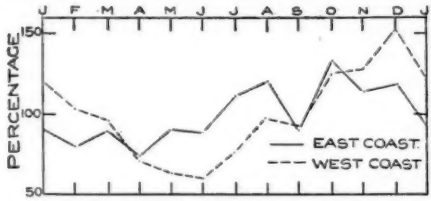

Fig 1.—Rainfall

predominating Atlantic conditions there. Data are taken from the "Book of Normals".

The object of the comparison in rainfall was to determine how the seasonal variation on the two sides of the country differed. The year's average total rainfall for each station was divided by 12 and the normal monthly rainfall at a station expressed as a percentage of that figure. The means of percentages for (1) east-coast stations and (2) west-coast stations are shown in Fig. 1. Each station individually shows much the same variation as the mean for its group. The comparative dryness of the west coast in May, June, July and August is an outstanding feature.

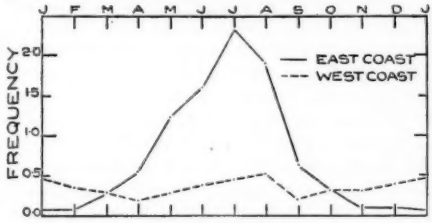

FIG 2.—THUNDERSTORMS

Fig. 2 shows the average number of thunderstorms each month at (1) east-coast stations and (2) west-coast stations.

M. T. SPENCE.

REVIEWS

A Manual of the Principles of Meteorology. By R. Mountford Deeley. Size 8vo, pp. xi + 285. *Illus.* London, Charles Griffin and Company, Ltd. 15*s.* net.

The title of this book is rather an ambitious one. In the preface the author states that the object of the book is to place before the general reader, in simple language, the author's conceptions of those conditions obtaining in the atmosphere of the earth which give rise to weather and climate. It does not, therefore, claim to give what we might call the generally accepted views of the nature of atmospheric phenomena, when these views differ from those of the author, and so a less ambitious title might have been more suitable.

The book is divided into fourteen chapters. The introductory chapter gives a general description of the astronomical facts relating to the motion of the earth round the sun, the distribution of land over the surface of the globe, and some general comments on the motion of the atmosphere. Subsequent chapters deal with the composition of the atmosphere, insolation, atmospheric temperatures, pressures, humidity and the relation of air density to water vapour content, leading up to a discussion of the winds of the globe, cyclones, anticyclones and climatic changes in the past. In many places the treatment of the fundamental facts appears to the present reviewer to be misleading. For example, we read on page 39 that on a plateau

3,000 metres high the sun's rays have lost 30 per cent. of their heating power, even when the air is bright and clear, and that on an average only about 24 per cent. of the heat radiations reach the earth's surface. These figures are not those with which the reviewer is familiar, and he feels that the author should give some explanation of the method by which such estimates are obtained. There are also such sentences as the following which are more than a little puzzling to the reader, " . . . the temperatures in the interior of cyclones and anticyclones up to considerable altitudes are such that it is impossible to explain the existence of these disturbances as being due to the specific weight of the column of air, and . . . one is inevitably led to explain them as the result of the influence of the general circulation." The reviewer has quite failed to make out precisely what is implied in this statement. Then on page 82 there is a statement that the surfaces of contact of currents of air of different origin and having greatly different temperatures and humidities show light fleecy clouds which change their forms with great rapidity. In contrast with this statement, the generally accepted view is that the heaviest rain and the thickest cloud sheets in a cyclone are to be found at such surfaces of separation of currents of different temperature and humidity. On page 99 the author writes " its position (the troposphere's position) being the result of heat rising from low levels meeting the heat energy descending from high levels." Such a statement requires far more elaboration to be understood by the reader, particularly the reader for whom the book was avowedly written. As put, it does not seem to have any particular meaning.

The reviewer could quote a number of other examples of statements which he finds either unacceptable or beyond his ability to understand, but enough has been quoted to show that the author does not adopt the views which are common among meteorologists. In later chapters, the author devotes considerable space to the solar relationships of weather, and puts forward a view that the cause of the cyclone and anticyclone is to be found in the localised heating of the upper atmosphere by corpuscles of an electrical nature coming from the sun. This theory would appear to be rather a desperate expedient to adopt until we are satisfied that the explanation is not to be found nearer the earth's surface than this theory would imply. In any case, such a theory still leaves the problem in an unsolved state, as it gives no indication why the absorption in question should favour now one part of the earth, now another.

The very brief mention of the work of V. Bjerknes does not allude to the association of weather with the fronts in a depression, an association which most meteorologists would regard as the most useful advance in meteorology in the present century. Nor is there any explanation of the fact that the diurnal and annual variations of temperature over the oceans are so much less than those over the land, which appears to the present reviewer to be one of the most

important and fundamental factors in the meteorology of the atmosphere.

The author has spent a great deal of time and labour in the preparation of the book. The part which appeared to the present reviewer to be of most interest was the discussion in Chapter XI of the variations of pressure in high latitudes, in connexion with which the author has given a number of charts of the pressure over most of the northern hemisphere for a number of selected days, which bring out very strongly the variability of the pressure distribution from day to day. The main criticism which can be offered of the book as a whole is that it is far too much an expression of the personal opinions of the author, opinions which are not by any means always backed up by sound reasons. For the price of fifteen shillings the reader is entitled to expect that he shall receive at least an authoritative statement of the present position of meteorology, and the reviewer does not consider that Mr. Deeley's book fulfils this expectation.

D. BRUNT.

Meteorological conditions affecting aviation over the North-west Frontier. By Flt.-Lieut. R. G. Veryard, B.Sc., R.A.F., and A. K. Roy, B.A., B.Sc., India Meteorological Department NO–M/2, Delhi, 1934

This pamphlet by the meteorological officers responsible for the issue of forecasts to the Royal Air Force at Peshawar and Quetta, gives what is probably the most complete account of the climate and weather of the north-west frontier of India yet published. Although primarily written for aviation, it should prove a mine of information for many other purposes.

The account opens with a description of the geography of the region, a knowledge of which is essential to the understanding of its meteorology. Orographic effects are of extreme importance in this highly mountainous region in which are included the riverain plain of the Indus, the deep gorges of Chitral and some of the highest mountains in the world. There follows a summary of the climate of the region as a whole with special reference to seasonal variations of rainfall, cloud, visibility, winds, snow, thunderstorms and air density. This is amplified in the next section in which we are given a fuller description of various parts of the frontier having different climatic characteristics. We learn that the year may be divided into four periods: winter from December to April, summer monsoon from July to September, and two transition periods. The winter period is characterised by the frequent passage of depressions from the west which give much low cloud, rain, and snow. In the transition period from winter to summer weather is mainly dry but there are frequent dust storms and visibility is poor on account of dust haze. The summer monsoon gives much rain in the extreme north but only when an occasional depression from the Bay of

Bengal or the Arabian Sea reaches them is there much rain in the central and southern parts. During the transition from summer to winter weather is mainly fine. The description is accompanied by isobaric charts showing typical winter and summer depressions, by anemograms of duststorms and by a photograph showing the effect of large hail on an aeroplane and one of the Peshawar tornado of April, 1933.

Twenty-two pages at the end are occupied by tables. There are first of all tables giving monthly means and extreme values of pressure, temperature and rainfall for nine stations. Then there are frequency tables of surface and upper winds at Peshawar and Quetta together with mean monthly temperatures from the surface to 4·5 Km. above these places. Finally there are monthly rainfall normals for over ninety stations.

G. A. BULL.

BOOKS RECEIVED

Annali del R. Ufficio Centrale di Meteorologia e Geofisica Italiano, Serie terza, Osservazioni—1923. Ministero dell'agricoltura e foreste, Rome, 1934.

NEWS IN BRIEF

We learn that M. Gustaf Slettenmark has been appointed Director of the Swedish State Meteorological-Hydrographic Service in place of the late Dr. Axel Walten.* M. Slettenmark is the late Director of the Hydrological Section.

The Weather of August, 1935

Pressure was below normal over Canada, the United States, Greenland, Iceland, Spitsbergen, and most of southern Europe, the greatest deficits being 3·5 mb. near Salt Lake City, 5·0 mb. at Jan Mayen, and 2·1 mb. near Erzerum, while pressure was above normal over most of the North Atlantic and northern Europe, the greatest excesses being 4·5 mb. at 50° N., 30° W., and 3·5 mb. at Vardö. In Sweden temperature was about normal and the rainfall generally about half the normal.

The characteristic features of the weather of August over the British Isles were two warm dry spells during the first three weeks and the cool wet spell, especially in the south of England, during the last part of the month. Thunderstorms were frequent. From the 1st to 7th the British Isles was under the influence of an anticyclone centred between the Azores and Ireland, and warm quiet dry weather was experienced with much sunshine, except locally in Scotland and Ireland, where slight rain fell at times due to the approach of depressions which were moving across Iceland. Among the largest

* See *Meteorological Magazine*, 70, 1935, p. 49.

amounts of sunshine registered were 15·1 hrs. at Dovercourt on the 2nd, 14·7 hrs. at Leuchars on the 6th. Temperature rose in England during this time, being above 80° F. locally from the 5th to 8th; 88° F. was recorded at Greenwich on the 8th and 86° F. at Manchester, Mildenhall and Croydon on the 7th, and South Farnborough on the 8th. From the 8th to 12th shallow depressions passed across the country. Rain fell generally in Scotland and Ireland, except on the 12th, and thunderstorms accompanied in some cases by heavy rain, occurred in east England and the Midlands on the 8th and 9th and in south England on the 12th; 1·10 in. was measured at Felixstowe on the 8th. Sunshine records were, however, mostly good in England. On the 12th the anticyclone over the Atlantic extended north over Scotland and then moved south-eastwards, so that fair to cloudy, warm dry weather was experienced generally over the country until the 20th, except on one or two days when depressions to the north brought rain mainly slight and usually only in the north and west. Thunderstorms, however, occurred at many places in north and east England on the 17th or 18th; 2·62 in. fell at Staindrop (Durham) in a thunderstorm and 2·16 in. in 1¼ hours at Thetford (Norfolk) on the 18th. Fog occurred on the 17th and 18th along the coasts of the Irish Sea and in the extreme north. On the 20th to 22nd the weather became generally sunny in Great Britain and temperature rose, especially in England, 91° F. was reached at Greenwich and 89°F. at Cranwell and Hunstanton on the 22nd. In Ireland rain occurred on all three days and in Scotland there were showers on the 21st with a thunderstorm at Aberdeen. From the 23rd to 31st complex low pressure systems extended over the whole country except temporarily on the 24th and 25th, when a wedge of high pressure spread across the west and north. Much rain occurred generally, with thunderstorms in the south-east on the 23rd and 24th and more widespread from the 28th to 30th; 3·04 in. fell at Mevagissey (Cornwall) on the 23rd, 2·31 in. at Hawkshead (Lancashire) on the 26th, and 2·12 in. at Peaslake (Surrey) on the 24th. Fresh to strong winds were experienced in the western English Channel on many days and in the north on the 27th and 29th, while temperature was generally a little below normal and did not exceed 65° F. at most places on the 30th. Slight ground frost occurred locally on the 28th and 29th. The distribution of bright sunshine for the month was as follows:—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway ...	83	−48	Chester ...	190	+36
Aberdeen ...	149	+10	Ross-on-Wye ...	194	+27
Dublin	165	+9	Falmouth ...	218	+20
Birr Castle ...	136	−2	Gorleston ...	226	+31
Valentia... ...	136	−14	Kew	191	+8

Miscellaneous notes on weather abroad culled from various sources

Five persons lost their lives in thunderstorms and floods in Spain about the 9th. A series of violent thunderstorms accompanied by heavy rain did much damage over a large part of France on the 12th, particularly at Amiens, Bordeaux, Châlons-sur-Saône and Nimes, and also swept across southern Piedmont and central Liguria on the night of the 12th and on the 13th; the torrential rain in the Ovada region caused a dam which protects Ovada to break, flooding an area 2½ miles by 1½ miles—it was estimated that 150–200 people lost their lives. Nine deaths were caused by a severe storm in the Budapest region on the 14th. A violent thunderstorm broke over Naples and the neighbourhood on the 20th—Castellammare was flooded after torrential rains and 12 people were killed. Thunderstorms were again experienced along the whole Riviera on the 25th and also in the hinterland, parts of Milan and Toulon were flooded and a waterspout in the Port of Genoa did extensive damage. A thunderstorm over Nice on the 28th put all the electric services out of action. (*The Times*, August 10th–30th.)

Snow was reported from many parts of South Africa on the 2nd. (*The Times*, August 3rd.)

The monsoon continued strong in the Punjab and Central and United Provinces during most of the month, but elsewhere it was mainly weak and more rain was needed in parts of Bombay and Deccan at the end of the month, though in Bombay City heavy rain caused damage to houses and in Chota Nagpur caused floods in parts of Bihar and west Bengal—more than 6 in. of rain is said to have fallen between 7 and 9 p.m. on the 13th at Jharia. By the 16th these floods were subsiding. Many people were killed in central and northern Luzon in the Philippine Islands by a typhoon and the floods which followed it. Heavy rain in Osaka and Kobe on the 9th and 10th caused floods over a wide area and four people were killed by landslides. A typhoon moving slowly north-east passed across south-west Japan on the 27th causing extensive damage by flood and wind over a wide area from Kiushu to Kobe. It then followed a circular track over the Sea of Japan to Kiushu and passed northwards over Shikoku towards Tokyo, which it reached on the 29th with greatly diminished force. (*The Times*, August 6th–September 2nd.)

Storms occurred in the neighbourhood of Adelaide on the 1st. Beneficial rains were experienced in most parts of Australia at the beginning of the month except in New South Wales, where there were mainly only light and scattered showers. (*The Times*, August 2nd–8th.)

General rains were experienced in the western grain-growing regions of Canada early but later the weather there was mainly cool and showery with hail and frost locally. A heat wave occurred in eastern Canada about the 19th. A severe gale occurred along the

coasts of Newfoundland near St. John's on the 25th, when several small vessels with their crews were lost. Sudden storms occurred along the northern Atlantic coasts of the United States on the 1st and several days of rain caused severe floods in eastern Ohio about the 7th. Temperature was about or above the normal generally in the United States, while the rainfall was mainly below normal, except locally in the Ohio Valley. (*The Times*, August 3rd–September 2nd, and *Washington D.C., U.S. Dept., Agric., Weekly Weather and Crop Bulletin.*)

Daily Readings at Kew Observatory, August, 1935

Date	Pressure, M.S.L. 13h.	Wind, Dir., Force 13h.	Temp. Min.	Temp. Max.	Rel. Humn. 13h.	Rain.	Sun.	Remarks. (see vol. 69, 1934, p. 1).
	mb.		°F.	°F.	%	in.	hrs.	
1	1019·8	S.1	50	69	54	—	1·4	w early.
2	1021·1	ENE.3	50	72	43	—	12·2	w early.
3	1023·2	NNE.2	52	71	68	—	2·1	
4	1023·9	NW.2	52	75	54	—	5·5	
5	1026·7	NE.2	53	79	46	—	9·2	w early.
6	1029·0	NE.2	57	81	45	—	9·9	w early.
7	1024·2	NNE.2	59	84	44	—	8·7	w early.
8	1015·0	S.3	60	85	38	—	7·5	
9	1016·4	NW.3	63	72	69	—	6·3	
10	1020·2	SW.3	54	79	45	—	13·5	
11	1015·2	SW.3	57	80	45	—	10·0	w early.
12	1006·5	NNE.3	55	73	51	0·09	0·2	r_0r 18h.–23h.
13	1013·9	NE.4	52	68	41	—	11·3	
14	1018·4	WNW.3	47	68	52	—	4·9	w early.
15	1021·7	N.1	58	69	46	—	1·8	
16	1021·0	WSW.2	55	71	66	—	2·4	pr_0 13h.
17	1018·9	WSW.2	53	74	56	—	2·2	w early.
18	1018·4	WNW.3	60	72	55	0·03	2·0	r_0 1h.–2h. & 8h.
19	1019·9	WSW.2	57	77	58	—	6·2	
20	1021·8	N.1	61	81	47	—	10·7	
21	1014·6	S.3	59	83	38	—	12·1	w early.
22	1011·9	SW.3	59	84	44	—	12·6	
23	1010·5	ENE.1	58	69	94	0·41	0·0	tlrR 6h.–8h.
24	1007·8	WSW.2	60	65	95	0·54	0·0	r_0–r1h.–13h.,16h.–22h.
25	1016·9	S.2	54	71	59	—	5·9	F till 7h. 15m.
26	1009·9	SW.2	59	75	79	—	4·0	F till 8h. 30m.
27	999·5	WNW.3	59	64	52	0·26	6·3	tlR 3h.–5h.
28	998·2	NNW.2	44	65	49	—	8·7	w early.
29	1005·5	SW.3	48	64	53	—	8·2	w early.
30	1010·7	SW.4	53	63	65	0·59	0·7	r_0–r 13h.–21h.
31	1009·3	SW.4	56	69	67	0·07	4·8	r_0–r 0h.–1h., 4h.–5h.
*	1015·8	—	55	73	55	1·99	6·17	* Means or totals.

General Rainfall for August, 1935.

England and Wales ...	80	per cent. of the average 1881–1915.
Scotland	87	
Ireland	75	
British Isles	81	

Rainfall: August, 1935: England and Wales

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Lond.	Camden Square.....	1·82	82	*Leics.*	Thornton Reservoir ...	1·83	65
Sur.	Reigate, Wray Pk. Rd..	3·97	162	„	Belvoir Castle.....	1·39	53
Kent.	Tenterden, Ashenden...	3·70	162	*Rut.*	Ridlington	2·20	88
„	Folkestone, Boro. San.	4·40	...	*Lincs.*	Boston, Skirbeck.....	1·44	60
„	Eden'bdg., Falconhurst	3·96	151	„	Cranwell Aerodrome...	1·31	48
„	Sevenoaks, Speldhurst.	3·53	...	„	Skegness, Marine Gdns.	1·96	80
Sus.	Compton, Compton Ho.	3·44	111	„	Louth, Westgate.....	2·45	87
„	Patching Farm.....	4·17	165	„	Brigg, Wrawby St.....	1·30	...
„	Eastbourne, Wil. Sq....	4·31	174	*Notts.*	Worksop, Hodsock.....	1·07	44
„	Heathfield, Barklye....	4·67	173	*Derby.*	Derby, L. M. & S. Rly.	1·25	48
Hants.	Ventnor, Roy.Nat.Hos.	3·74	188	„	Buxton, Terr. Slopes...	2·31	53
„	Fordingbridge, Oaklnds	3·10	118	*Ches.*	Runcorn, Weston Pt....	1·62	45
„	Ovington Rectory.....	3·62	134	*Lancs.*	Manchester, Whit. Pk.	2·00	58
„	Sherborne St. John.....	3·03	125	„	Stonyhurst College.....	1·64	32
Herts.	Royston, Therfield Rec.	1·09	42	„	Southport, Bedford Pk.	2·73	78
Bucks.	Slough, Upton.....	1·86	86	„	Lancaster, Greg Obsy.	2·82	62
„	H. Wycombe, Flackwell	1·60	66	*Yorks.*	Wath-upon-Dearne.....	1·90	79
Oxf.	Oxford, Mag. College...	1·67	74	„	Wakefield, Clarence Pk.	1·89	73
Nor.	Wellingboro, Swanspool	2·08	87	„	Oughtershaw Hall.....	3·54	...
„	Oundle	2·52	...	„	Harrogate, Harlow Mr.	1·88	64
Beds.	Woburn, Exptl. Farm...	2·09	90	„	Hull, Pearson Park.....	1·91	65
Cam.	Cambridge, Bot. Gdns.	1·56	66	„	Holme-on-Spalding.....	2·11	79
Essex.	Chelmsford, County Lab	2·20	101	„	West Witton, Ivy Ho.	2·43	83
„	Lexden Hill House.....	1·17	...	„	Felixkirk, Mt. St. John.	3·26	114
Suff.	Haughley House.....	1·25	...	„	York, Museum Gdns....	2·23	88
„	Campsea Ashe.....	1·63	82	„	Pickering, Hungate.....	1·35	153
„	Lowestoft Sec. School...	2·42	110	„	Scarborough.....	1·24	45
„	Bury St. Ed., WestleyH.	1·14	44	„	Middlesbrough.....	2·29	84
Norf.	Wells, Holkham Hall...	·67	28	„	Baldersdale, Hury Res.	1·48	42
Wilts.	Calne, Castle Walk.....	2·30	...	*Durh.*	Ushaw College.....	2·23	77
„	Porton, W.D. Exp'l. Stn	1·87	83	*Nor.*	Newcastle, Town Moor.	2·24	77
Dor.	Evershot, Melbury Ho.	2·60	83	„	Bellingham, Highgreen	2·63	74
„	Weymouth, Westham.	2·64	123	„	Lilburn Tower Gdns....	4·20	149
„	Shaftesbury, Abbey Ho.	2·48	85	*Cumb.*	Carlisle, Scaleby Hall...	2·38	58
Devon.	Plymouth, The Hoe....	2·92	94	„	Borrowdale, Seathwaite	8·50	78
„	Holne, Church Pk. Cott.	3·20	72	„	Borrowdale, Moraine...	5·47	63
„	Teignmouth, Den Gdns.	2·78	122	„	Keswick, High Hill.....	2·54	49
„	Cullompton	2·13	70	*West.*	Appleby, Castle Bank...	1·64	50
„	Sidmouth, U.D.C.....	2·56	...	*Mon.*	Abergavenny, Larchf'd	1·34	45
„	Barnstaple, N. Dev.Ath	3·59	109	*Glam.*	Ystalyfera, Wern Ho....	2·95	48
„	Dartm'r, Cranmere Pool	3·60	...	„	Cardiff, Ely P. Stn.....	2·30	53
„	Okehampton, Uplands.	2·58	61	„	Treherbert, Tynywaun.	3·44	...
Corn.	Redruth, Trewirgie.....	3·62	106	*Carm.*	Carmarthen, The Friary	1·88	40
„	Penzance, Morrab Gdn.	2·30	73	*Pemb.*	St. Ann's Hd, C. Gd. Stn.	1·40	44
„	St. Austell, Trevarna...	4·76	132	*Card.*	Aberystwyth	4·35	...
Soms.	Chewton Mendip.....	2·05	46	*Rad.*	BirmW.W.Tyrmynydd	2·16	40
„	Long Ashton.....	1·97	56	*Mont.*	Lake Vyrnwy	1·51	29
„	Street, Millfield.....	...	...	*Flint.*	Sealand Aerodrome.....	1·41	49
Glos.	Blockley	1·38	...	*Mer.*	Dolgelley, Bontddu.....	3·82	68
„	Cirencester, Gwynfa....	2·06	69	*Carn.*	Llandudno	1·81	64
Here.	Ross, Birchlea.....	1·39	54	„	Snowdon, L. Llydaw 9..	6·38	...
Salop.	Church Stretton.....	1·28	39	*Ang.*	Holyhead, Salt Island...	1·80	57
„	Shifnal, Hatton Grange	1·19	42	„	Lligwy	2·45	...
Staffs.	Market Drayt'n, Old Sp.	1·46	44	*Isle of Man*			
Worc.	Ombersley, Holt Lock.	1·59	59		Douglas, Boro' Cem....	1·59	41
War.	Alcester, Ragley Hall...	1·14	41	*Guernsey*			
„	Birmingham, Edgbaston	2·16	80		St. PeterP't. Grange Rd.	1·44	61

Rainfall: August, 1935: Scotland and Ireland

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Wig .	Pt. William, Monreith.	1·56	41	*Suth* .	Melvich	4·31	145
„ .	New Luce School	1·95	44	„ .	Loch More, Achfary	7·27	124
Kirk .	Dalry, Glendarroch	1·76	37	*Caith* .	Wick	2·93	107
„ .	Carsphairn, Shiel	2·07	31	*Ork* .	Deerness	3·80	132
Dumf.	Dumfries, Crichton, R.I.	3·15	83	*Shet* .	Lerwick	3·57	118
„ .	Eskdalemuir Obs.	5·04	98	*Cork* .	Caheragh Rectory	...	...
Roxb .	Hawick, Wolfelee	3·35	100	„ .	Dunmanway Rectory	3·07	65
Selk .	Ettrick Manse	2·96	57	„ .	Cork, University Coll.	2·68	79
Peeb .	West Linton	1·86	...	„ .	Ballinacurra	1·60	43
Berw .	Marchmont House	3·16	95	„ .	Mallow, Longueville	2·08	67
E.Lot .	North Berwick Res.	3·61	114	*Kerry.*	Valentia Obsy.	4·70	98
Midl .	Edinburgh, Roy. Obs.	2·53	79	„ .	Gearhameen	5·20	68
Lan .	Auchtyfardle	1·44	...	„ .	Bally McElligott Rec.	3.50	...
Ayr .	Kilmarnock, Kay Pk.	1·90	...	„ .	Darrynane Abbey	5·03	116
„ .	Girvan, Pinmore	1·71	38	*Wat* .	Waterford, Gortmore	1·03	27
Renf .	Glasgow, Queen's Pk.	2·52	71	*Tip* .	Nenagh, Cas. Lough	5·72	145
„ .	Greenock, Prospect H.	2·94	54	„ .	Roscrea, Timoney Park	3·02	...
Bute .	Rothesay, Ardencraig	2·22	...	„ .	Cashel, Ballinamona	2·20	62
„ .	Dougarie Lodge	1·34	...	*Lim* .	Foynes, Coolnanes	3·63	94
Arg .	Ardgour House	9·88	...	„ .	Castleconnel Rec.	3·66	...
„ .	Glen Etive	8·63	115	*Clare* .	Inagh, Mount Callan	5·69	...
„ .	Oban	4·02	...	„ .	Broadford, Hurdlest'n.	3·61	...
„ .	Poltalloch	5·38	110	*Wexf* .	Gorey, Courtown Ho.	1·62	49
„ .	Inveraray Castle	6·73	102	*Wick* .	Rathnew, Clonmannon.	1·44	...
„ .	Islay, Eallabus	4·45	102	*Carl* .	Hacketstown Rectory	2·20	54
„ .	Mull, Benmore	...	...	*Leix* .	Blandsfort House	3·85	97
„ .	Tiree	5·04	120	*Offaly.*	Birr Castle	3·23	85
Kinr .	Loch Leven Sluice	3·51	92	*Dublin*	Dublin, FitzWm. Sq.	2·25	74
Perth .	Loch Dhu	5·00	74	„ .	Balbriggan, Ardgillan	1·98	58
„ .	Balquhidder, Stronvar.	3·18	...	*Meath.*	Beauparc, St. Cloud	2·51	...
„ .	Crieff, Strathearn Hyd.	2·31	55	„ .	Kells, Headfort	3·84	92
„ .	Blair Castle Gardens	2·30	68	*W.M* .	Moate, Coolatore	2·79	...
Angus.	Kettins School	1·50	41	„ .	Mullingar, Belvedere	3·81	91
„ .	Pearsie House	2·06	...	*Long* .	Castle Forbes Gdns.	2·90	71
„ .	Montrose, Sunnyside	1·82	65	*Gal* .	Galway, Grammar Sch.	3·87	...
Aber .	Braemar, Bank	2·61	76	„ .	Ballynahinch Castle	7·43	135
„ .	Logie Coldstone Sch.	...	...	„ .	Ahascragh, Clonbrock.	2·42	58
„ .	Aberdeen, King's Coll.	2.38	87	*Mayo.*	Blacksod Point	3·70	81
„ .	Fyvie Castle	1·94	61	„ .	Mallaranny	6·03	...
Moray	Gordon Castle	3·02	95	„ .	Westport House	3·73	92
„ .	Grantown-on-Spey	2·82	88	„ .	Delphi Lodge	9·94	115
Nairn.	Nairn	2·98	124	*Sligo* .	Markree Obsy.	3·17	73
Inv's .	Ben Alder Lodge	2·91	...	*Cavan.*	Crossdoney, Kevit Cas.	3·49	...
„ .	Kingussie, The Birches.	3·60	...	*Ferm* .	Enniskillen, Portora	...	...
„ .	Inverness, Culduthel R.	4·55	...	*Arm* .	Armagh Obsy.	2·80	77
„ .	Loch Quoich, Loan	14·30	...	*Down.*	Fofanny Reservoir	2·35	...
„ .	Glenquoich	7·16	87	„ .	Seaforde	1·30	35
„ .	Arisaig, Faire-na-Sguir.	5·69	...	„ .	Donaghadee, C. Stn.	1·75	53
„ .	Fort William, Glasdrum	6·53	...	„ .	Banbridge, Milltown	...	...
„ .	Skye, Dunvegan	4·90	...	*Antr* .	Belfast, Cavehill Rd.	2·73	...
„ .	Barra, Skallary	4·71	...	„ .	Aldergrove Aerodrome.	1·43	40
R&C .	Alness, Ardross Castle.	3·14	106	„ .	Ballymena, Harryville.	1·86	44
„ .	Ullapool	3·65	103	*Lon* .	Garvagh, Moneydig	2·13	...
„ .	Achnashellach	5·36	80	„ .	Londonderry, Creggan.	2·59	56
„ .	Stornoway	3·63	91	*Tyr* .	Omagh, Edenfel	3·04	71
Suth .	Lairg	2·90	91	*Don* .	Malin Head	2·96	...
„ .	Tongue	4·81	150	„ .	Killybegs, Rockmount.	3·80	...

Climatological Table for the British Empire, March, 1935

STATIONS.	PRESSURE.		TEMPERATURE.							Relative Humidity.	Mean Cloud Am'nt	PRECIPITATION.			BRIGHT SUNSHINE.	
			Absolute.		Mean Values.				Mean.							
	Mean of Day M.S.L.	Diff. from Normal.	Max.	Min.	Max.	Min.	½ Max. and Min.	Diff. from Normal	Wet Bulb.			Am'nt.	Diff. from Normal.	Days.	Hours per day.	Per-centage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0–10	in.	in.			
London, Kew Obsy.	1021·4	+ 8·0	63	30	51·1	38·5	44·8	+ 2·4	38·5	85	8·3	0·37	− 1·32	6	3·5	30
Gibraltar	1018·8	+ 1·7	71	43	63·4	52·1	57·7	+ 0·1	51·2	80	6·3	1·66	− 3·08	8	...	...
Malta	1016·3	+ 2·1	63	43	58·2	50·1	54·1	− 3·0	50·5	79	5·8	4·38	+ 2·90	11	6·3	53
St. Helena	1010·9	− 0·4	73	62	69·5	63·1	66·3	0·0	64·0	97	9·1	2·51	...	20	...	...
Freetown, Sierra Leone	1012·5	+ 1·8	90	68	86·7	72·5	79·6	− 2·8	72·3	76	4·7	0·00	− 1·16	0	...	...
Lagos, Nigeria	...	...	92	71	89·0	77·8	83·4	0·0	78·0	83	7·5	8·36	+ 4·61	7	6·3	53
Kaduna, Nigeria	1006·1	...	101	54	96·6	66·7	81·7	+ 0·6	67·3	58	3·8	0·45	− 0·09	3	8·2	68
Zomba, Nyasaland	1011·2	+ 1·5	83	54	77·1	63·1	70·1	− 1·2	66·3	77	7·5	15·32	+ 6·24	17	...	...
Salisbury, Rhodesia	1012·2	− 0·2	85	46	78·4	57·0	67·7	− 0·5	60·7	72	5·3	4·53	− 0·17	13	6·8	56
Cape Town	1014·9	+ 0·4	93	46	76·5	57·6	67·1	− 1·0	57·5	74	4·2	0·84	− 0·04	7	...	...
Johannesburg	1013·4	− 0·2	85	46	71·6	52·5	62·1	− 1·3	54·3	71	5·1	4·69	+ 0·25	10	7·5	61
Mauritius	1012·1	+ 0·1	86	70	84·0	72·7	78·3	+ 0·3	74·8	80	5·8	3·62	− 5·75	18	7·8	64
Calcutta, Alipore Obsy.	1009·7	− 0·2	99	63	92·5	70·8	81·7	+ 1·5	70·5	81	3·2	0·99	− 0·39	2*	...	...
Bombay	1010·5	− 0·4	101	66	88·9	71·7	80·3	+ 0·8	69·1	66	0·9	0·00	− 0·02	0*	...	...
Madras	1010·1	− 0·8	95	66	89·0	72·5	80·7	− 0·4	74·7	77	4·2	0·00	− 0·34	0*	...	...
Colombo, Ceylon	1010·0	− 0·1	93	68	87·9	73·8	80·9	− 0·9	76·3	71	5·1	3·76	− 0·52	10	8·6	70
Singapore	1009·2	− 0·5	91	74	87·7	75·7	81·7	+ 0·5	77·4	78	7·5	8·10	+ 0·70	14	6·1	50
Hongkong	1014·7	− 1·3	82	57	71·3	62·8	67·1	+ 3·8	63·1	83	8·3	4·67	+ 1·73	12	3·4	29
Sandakan	1009·7	...	90	73	87·5	75·5	81·5	+ 0·5	77·7	82	6·9	3·97	− 4·50	14	...	...
Sydney, N.S.W.	1015·9	− 0·4	90	49	76·9	60·5	68·7	− 0·6	62·4	69	6·0	2·36	− 2·62	12	7·9	65
Melbourne	1016·1	− 0·8	90	43	72·6	53·1	62·9	− 1·6	56·8	66	6·5	1·60	− 0·58	12	6·3	51
Adelaide	1016·0	− 1·1	102	49	81·2	61·2	71·2	+ 1·4	58·7	46	6·2	2·46	+ 1·43	12	6·4	52
Perth, W. Australia	1014·2	− 1·1	104	49	81·2	60·4	70·8	− 0·4	59·3	56	2·9	0·16	− 0·65	2	9·4	76
Coolgardie	1014·2	− 0·6	105	45	81·3	56·8	69·1	− 2·8	60·1	61	4·5	1·00	+ 0·06	5	...	...
Brisbane	1015·1	+ 0·7	91	55	81·7	64·6	73·1	− 1·2	66·8	65	4·4	1·05	− 4·72	10	8·4	69
Hobart, Tasmania	1013·0	− 1·2	85	42	65·3	50·2	57·7	− 1·6	51·2	61	5·9	1·56	− 0·14	13	6·4	52
Wellington, N.Z.	1016·9	− 0·3	80	43	67·7	55·4	61·5	+ 0·9	57·7	73	7·5	3·79	+ 0·46	8	6·2	50
Suva, Fiji	1008·2	− 0·2	92	74	87·4	75·9	81·7	+ 1·6	76·7	83	7·5	11·34	− 3·15	26	5·4	44
Apia, Samoa	1008·7	− 0·5	88	74	84·7	75·5	80·1	+ 0·8	77·2	83	7·2	22·56	+ 8·58	27	5·4	44
Kingston, Jamaica	1015·6	+ 0·7	89	65	84·9	67·4	76·1	− 1·0	65·8	81	2·8	0·40	− 0·62	5	7·8	65
Grenada, W.I.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	1017·2	− 0·1	68	10	43·2	27·9	35·5	+ 5·9	29·9	74	6·8	1·25	− 1·16	10	4·9	41
Winnipeg	1013·6	− 5·6	40	−13	26·4	9·6	18·0	+ 3·0	...	...	7·6	2·84	+ 1·68	14	4·0	34
St. John, N.B.	1012·9	− 1·2	46	−2	35·1	20·1	27·6	− 0·8	22·4	73	4·6	2·36	− 2·18	19	6·1	51
Victoria, B.C.	1013·0	− 2·9	57	31	47·2	37·1	42·1	− 1·4	39·5	80	6·1	2·94	+ 0·51	16	4·8	40

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

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Winnipeg	1013·6	− 5·6	40	−13	26·4	9·6	18·0	+ 3·0	...	...	7·6	2·84	+ 1·68	14	4·6	34
St. John, N.B.	1012·9	− 1·2	46	−2	35·1	20·1	27·6	− 0·8	22·4	73	4·6	2·36	− 2·18	19	6·1	51
Victoria, B.C.	1013·0	− 2·9	57	31	47·2	37·1	42·1	− 1·4	39·5	80	6·1	2·94	+ 0·51	16	4·8	40

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.